

Remarks

This application has been reviewed in light of the Office Action of August 18, 2003. Claims 1-20 are pending, and all claims stand rejected. In response, claim 20 is amended, and the following remarks are submitted. Reconsideration of this application, as amended, is requested.

Claims 1-20 are rejected under 35 USC 103 over Salatino '343, Schar '273, Chiu '132, and Sato '064. Applicant traverses this ground of rejection.

The present invention provides a method for bonding two components together. A bonding medium, including malleable spheres and an uncured adhesive, is placed between the two components. The two components are then bonded together by pressing them together in a bonding apparatus so that the malleable spheres bond to the two components. The malleable spheres hold the two components in a fixed position for a period of time, and the adhesive is allowed to cure to further bond the two components together.

In a particularly advantageous use of the invention, the two components are removed from the bonding apparatus before the adhesive cures completely, and curing is completed with the two components removed from the bonding apparatus. The malleable spheres hold the two components together in precisely the right orientation during the completion of the curing, but after the bonding force is removed. This technique allows the expensive bonding apparatus to be used more efficiently, by being used only in the initial stages of the bonding. The partially bonded components are removed during the latter stages, so that more pairs of components may be processed through the single bonding apparatus.

None of the references contemplate such a process, as may be seen by comparing the teachings of the references with the claim recitations.

The following principle of law applies to all sec. 103 rejections. MPEP 2143.03

provides “To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).” [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Salatino, the primary reference, deals with optical techniques for aligning two elements that are to be bonded together. As depicted in Figure 1, Salatino teaches placing alignment indicia on a thermoplastic film (col. 3, lines 50-53), step 11. The thermoplastic film is aligned with and bonded to one of the elements by heating, steps 12 and 13 of Figure 1 and col. 3, line 57-col. 4, line 13. This first assembly is inverted and aligned with the other element, step 14 and col. 4, lines 14-23. Next, the first assembly is bonded to the other element by heating the thermoplastic film, step 14 of Figure 1 and col. 4, lines 30-40.

Significantly, and as recognized in the explanation of the rejection, there is no indication that there is any pressing together of the pieces being bonded through the thermoplastic film 40, or that any pressing apparatus is used. At col. 4, lines 30-33, Salatino indicates that adhesive securing is achieved simply by heating, with no mention of pressing or a pressing apparatus.

The explanation of the rejection contains some crucial misstatements regarding the process steps of Salatino. First, Applicant had pointed an important misstatement regarding what happens in various steps of Salatino in the Remarks of the prior Amendment, but the misstatement is repeated in the present Office Action without explanation or response. The explanation of the rejection (page 3, last two lines on page) argues that “...heating occurs after the joining...In Figure 1, pressing/joining occurs at step 14 and heating occurs afterwards at step 15.” This statement is not correct. In step 14, there is nothing more than an alignment (col. 4, lines 17-18). The

joining occurs solely in step 15 (col. 4, lines 31-33). Thus, the joining is accomplished by the heating and cooling of the thermoplastic adhesive material--heating/cooling and bonding are necessarily the same thing and are performed simultaneously. The "thereafter" language found near the end of claims 1, 11, and 20 is not met by the teachings of the references.

Second, the explanation of the rejection asserts that "Salatino discloses that the bonding medium comprises...at least two malleable particles..." There is no such teaching, and there is no indication that the conductive particles 37, 38 serve any bonding function. Salatino teaches "...the particles 31 between the opposing pads electrically connect the pads." There is no statement that there is any mechanical bonding of the particles to the opposing pads. (As an example, a switch element electrically connects the contacts, but it does not mechanically bond them together.) It may not be concluded that Salatino is teaching that the particles 31 are needed to bond the opposing pads mechanically, because in the preferred embodiment there was apparently sufficient bonding strength imparted by the thermoplastic film 40, even when the particles 31 were not present.

Third, the explanation of the rejection asserts that "Salatino discloses that the bonding medium comprises...a quantity of uncured adhesive. In fact, Salatino teaches that the bonding medium comprises a thermoplastic adhesive. Describing a thermoplastic adhesive as an "uncured" adhesive is incorrect. Curing is a concept that is not associated with thermoplastic adhesives. As found in the description of "thermoplastic" found in the evidentiary submission accompanying the prior Amendment, "these thermoplastics do not undergo cross-linking on heating". There are several references in the explanation of the rejection to "uncured", "curing", "setting" or the like as associated with Salatino, but these are misplaced and incorrect.

Fourth, there is a statement that "Salatino does disclose that the thermoplastic can be replaced by other known materials..." Salatino has no such teaching. At col. 4, lines 30-40, Salatino teaches that "...other methods of securing or adhesively securing the film to the chip and to the carrier are also contemplated..." There is no teaching of "other known materials". In fact, what Salatino teaches is that "A number of different

materials having advantageous properties may be used for the transparent film 40." (col. 4, lines 51-52). Salatino then immediately goes on in the same paragraph and the next paragraph (col. 4, line 53-col. 5, line 10) to give the example of what he means--the particles 37, 38 embedded in the thermoplastic film 40 constitutes the "different material". There is no mention or suggestion of thermosetting plastics or anything else that might replace the thermoplastic material of construction of the film 40 itself.

Salatino may not be used as a reference in constructing the present rejection because Salatino teaches directly away from the present claim recitations. It is a well-established principle of law that a *prima facie* case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)...As "a useful general rule,"..."a reference that 'teaches away' can not create a *prima facie* case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"

Salatino specifically teaches that the adhesive is a thermoplastic material, which is not an "uncured adhesive" that can later be the subject of the recited step of "curing the adhesive". A person of ordinary skill reading Salatino would be led to use a thermoplastic adhesive, not an uncured adhesive that can later be cured.

Schar teaches a different sort of a process. In Schar as in Salatino, there is no teaching of bump bonding between the two articles being bonded. In Schar, such bump bonding is not possible, as there is an interposed layer of adhesive that prevents such bump bonding. As may be seen in Figure 3C, the two substrates 342 and 350 are actually glued together solely with an adhesive bond accomplished by the adhesive 338 (col. 5, lines 6-9) and the (unnumbered) backfilled adhesive. There is no metal bump

extending between the two substrates 342 and 350. In one portion of Schar referenced in the explanation of the rejection, at col. 5, lines 47-64, Schar teaches starting with an LGA having bumps thereon. Then the adhesive is stencil printed in selected locations on the surface of the LGA. The adhesive is cured under pressure, presumably with a pressing tool, and at elevated temperature. The curing is performed for one hour at 150°C. However, this heating with an applied pressure is not sufficient to bond the bumps of the LGA to the pressing tool, because next "The semi-cured bumped LGA is dipped into a thin layer of the silver-silicone paste...so that the tips of the bumps are wetted by the paste." Clearly, to wet the tips of the bumps, the LGA had to have been separated from the pressing tool, to which the bumps therefore did not bond previously. Also, the next step is "The LGA and the bumps thereon are aligned with an placed in contact with the conductive sites of an FR-4 PCB. The LGA-PCB assembly is cured for one hour at 150°C." No pressure is indicated, and presumably the result is as depicted in Figure 3C. In fact, Schar teaches the absence of significant pressing (col. 3, lines 29-32).

Schar may not be used as a reference in constructing the present rejection, under the same legal principles discussed above. Whereas the present claims all recite "a sufficient bonding force to bond the malleable spheres both to the first component and to the second component" (claim 1) or the like, Schar expressly teaches against this limitation by requiring that there cannot be bump bonding between the substrates 342 and 350 because of the interposed adhesive 338 (see Fig. 3C). The person reading Schar would be led directly away from the claimed approach of bonding the malleable spheres both to the first component and to the second component.

Chiu teaches using "a layer of conducting adhesive or surface cleaning chemical 23 in opening 22", see Figure 2b and col. 2, lines 62-65. This adhesive layer 23 just holds the balls 12 in place, as otherwise they would fall out when the chip 10 was later inverted. The very thin layer of adhesive 23 does not extend to a sufficient thickness that it will contact the other article being bonded and therefore is not part of a bonding medium. There is no teaching that the conductive adhesive is thermosetting.

Sato achieves bonding by compression-bonded bumps and does not appear to

use an adhesive at all.

Claim 1 recites in part:

placing a bonding medium between the first component and the second component, the bonding medium comprising

at least two malleable spheres made of a metal that bonds to both the first component and to the second component when subjected to a sufficiently large force, and

a quantity of an uncured adhesive; thereafter

bonding the first component to the second component using the bonding medium, the step of bonding including the steps of

supplying a bonding apparatus having at least one force actuator;

the bonding apparatus pressing the first component against the second component in a facing-but-spaced-apart relation, with the bonding medium therebetween, with a sufficient bonding force to bond the malleable spheres both to the first component and to the second component, simultaneously

monitoring at least one measured bonding reaction of the first component and the second component, and simultaneously

controlling the bonding apparatus responsive to the step of monitoring, and thereafter

curing the adhesive."

Claims 11 and 20 are similar in relevant respects.

There is no teaching in the references of a bonding medium formed of malleable metal and uncured adhesive, and then bonding the metal to both the first and second components. Salatino has no teaching of metal bonding, Schar teaches that there can be no metal bonding, Chiu has no teaching of curable adhesives, and Sato has no

teaching of adhesives at all.

There is no teaching of "an uncured adhesive" and later "curing the adhesive" in the present context. Salatino teaches that a thermoplastic adhesive is used, Schar teaches a curable adhesive in conjunction with an express absence of metal bonding, Chiu has no teaching of curable adhesives, and Sato has no teaching of adhesives at all. The explanation of the rejection argues that "this thermoplastic [sic, thermoset] can replace the thermoplastic of Salatino..." But such a substitution is directly contrary to the teachings of Salatino, which teaches the "ease of use" of the thermoplastic (col. 4, lines 35-37). Salatino expresses no concern with the lack of a cured bond or being subject to heat, which are the rationales used for supporting the combination of teachings.

If the teachings of Schar were to be imported into Salatino, then presumably the teaching that there is no metal bonding between both components would also be imported to reinforce the absence of metal bonding in Salatino. The teaching of Schar that there is little or no bonding pressure used in forming the adhesive bond in Schar would also be utilized, as is consistent with the approach of Salatino. Then the whole teaching of Sato becomes irrelevant, as no bonding apparatus of the type taught by Sato is needed, and in fact would just be expensive and superfluous.

The explanation of the rejection of claims 3 and 13 includes the state of what is "understood" in the art. This appears to be a statement of a "well known in the art" argument, using different words. "Well known" and "understood" and the like are not classes of statutory prior art recognized in 35 USC 102 or 35 USC 103. Applicant traverses this substitution of asserted "understood" prior art for a statutory prior art reference as applied in the context of the claim. Here, the matters asserted to be "understood" are not, in this context. Applicant requests that, if the rejection is maintained, the Examiner apply a statutory prior art reference. MPEP 2144.03. Absent such an application of statutory prior art, Applicant requests that the rejection be withdrawn.

Arguments are made that this agglomeration of references somehow teaches the limitations of claim 4, but there is no indication of the source of this argument in the

references. In fact, these references have no such teaching. If the rejection is maintained, Applicant asks that the location of the asserted teachings be pointed out with particularity.

There is no asserted location of the teaching of the limitations of claims 5 and 14 identified, and nothing in the references has any such teaching.

Claim 20 further recites in part:

“curing the adhesive, the step of curing the adhesive including the steps of
removing the bonding force prior to completion of full curing of the
adhesive, and

removing the assembly from the bonding apparatus prior to full curing
of the adhesive.”

Claims 10 and 19 recite “removing the bonding force prior to completion of full curing of the adhesive”.

The explanation of the rejection asserts that “Salatino...discloses joining, and then heating. Therefore the joining force is removed before the heating or full curing of the adhesive” As noted earlier, Salatino does not disclose curing, and does not disclose a joining step prior to heating. Step 14 of Salatino is alignment, not joining. Joining only occurs by heating in step 15.

Applicant has demonstrated above that the references are not technically compatible. The case authority and the MPEP provide guidance on the legal issue.]

The present rejection seeks to perform a hindsight reconstruction based upon unrelated references, which is technically unsupported and is legally improper.

The case authority and the MPEP provide guidance on this point in two respects. First, MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2143.02 requires that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed

approach of combining the teachings of the applied references, particularly Salatino and Schar. The approaches of the references are inconsistent with each other, for reasons pointed out earlier.

Second, the present rejection is a sec. 103 combination rejection. It is well established that a proper sec. 103 combination rejection requires more than just finding in the references the elements recited in the claim (but which was not done here). To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2143 and 2143.01. See also, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

"The PTO has the burden under section 103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown

in order to extract specific teachings from the individual references:

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

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"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

* * * * *

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App.& Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the four unrelated references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. The various rationales presented in the explanation of the rejection are not found in the references as reasons to combine their

teachings with those of the other references. If the rejection is maintained, Applicant asks that the Examiner set forth the objective basis found in the references themselves for combining the teachings of the references.

Applicant asks that the Examiner reconsider and withdraw this ground of rejection.

Claims 9, 18, and 20 are rejected under 35 USC 103 over Salatino '343, Schar '273, Chiu '132, and Sato '064, and further in view of McArdle '172 or Insaka '667. Applicant traverses this ground of rejection.

The combination of Salatino, Schar, Chiu, and Sato does not teach the limitations of claims 1 and 11, whose limitations are incorporated into claims 9 and 18, or claim 20, for the reasons stated above. McArdle and/or Insaka do not add anything in this regard. Accordingly, this combination of 5 references does not teach the limitations of the rejected claims.

Applicant incorporates and repeats its requests for an objective basis for combining the helpful teachings and disregarding the unhelpful teachings of each reference.

Applicant asks that the Examiner reconsider and withdraw this ground of rejection.

Applicant submits that the application is in condition for allowance, and requests such allowance.

Respectfully submitted,



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